## REMARKS

In response to the Office Action mailed August 18, 2005, Applicant respectfully requests reconsideration. To further the prosecution of this Application, Applicant submits the following remarks and has added new claims. The claims as now presented are believed to be in allowable condition.

Claims 1-29 were pending in this Application. Claims 30-35 have been added. Accordingly, claims 1-35 are now pending in this Application. Claims 1 and 24 are independent claims.

## Preliminary Matters

Claim 3 was objected to as being dependent from itself. Claim 3 has been amended to be dependent from claim 2.

Claims 6 and 7 were objected to for lack of antecedent basis for the term "said separation distance". These claims have been amended to correct this deficiency.

## Rejections under §102 and §103

Claims 1-4, 8-10, 13, 18-25, and 27-29 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Published Application 2002/0172253 of Vetrovec ("Vetrovec"). Additionally, claims 5, 15, 17 and 26 were rejected under 35 U.S.C. §103(a) as being unpatentable over Vetrovec in view of U.S. Patent No. 5,561,550 of Tanuma ("Tanuma"); claims 5, 14 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Vetrovec in view of U.S. Patent No. 6,421,166 of Vesko ("Vesko"); claims 6-7 were rejected under 35 U.S.C. §103(a) as being unpatentable over Vetrovec in view of U.S. Patent No. 6,215,807 of Reilly ("Reilly"); and claims 11-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Vetrovec in view of U.S. Patent No. 5,115,445 of Mooradian ("Mooradian"). Applicant respectfully traverses each of

these rejections and requests reconsideration. The claims are in allowable condition.

With respect to the rejection of claims under 35 U.S.C. § 102, it is respectfully pointed out that:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference."
>
> *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

It is respectfully urged that the rejection under 35 U.S.C. § 102 is improper and should be withdrawn, because the above test is not satisfied. Vetrovec fails to teach all the elements of the rejected claims.

Claim 1 recites a system for coherent beam combination that includes:

an unstable resonator; and

at least two gain media located within the unstable resonator;

wherein a first electromagnetic field produced by a first gain medium of the at least two gain media propagates through a portion of a second gain medium of the at least two gain media after one or more roundtrips within the unstable resonator, and wherein the first electromagnetic field is in-phase with a second electromagnetic field produced by the second gain medium.

As illustrated with respect to the embodiment of Figure 1, a first magnetic field 108b' is created by a first gain medium such as gain medium 108b. It will be appreciated that this field 108b' exists independently of gain medium 108a, i.e., if gain medium 108a were not present, there would still be a field 108b' by the combined operation of the mirrors 104 and 106 along with the gain element 108b. Similarly, a separate field created by the gain medium 108a also exists, and is similarly independent of the field 108b'. Each field propagates through a portion of the other gain medium in an in-phase manner, so that they are coherently combined. In the embodiment of Figure 1, the propagation of a field

through the other gain medium in an in-phase manner is achieved by the placement of the two gain media 108a and 108b in a plane transverse to the longitudinal axis of the resonator (a configuration that is now set forth in new claims 30 and 33). That is, the symmetrical geometric juxtaposition of two independent fields ensures that they are coherently combined within each gain medium 108a and 108b.

Vetrovec teaches a laser oscillator employing gain media in an "active mirror" configuration. With reference to Figure 3 for example, there is shown a solid-state laser oscillator 10 having a laser gain assembly 11 placed in a linear (as opposed to ring) unstable resonator formed by end mirror 32 and an outcoupling and feedback assembly 40. The laser gain assembly 11 further comprises a plurality of "active mirror amplifier" (AMA) modules 80, with each such module containing a laser gain medium 82 in an AMA configuration. AMA modules 80 are positioned within the laser gain assembly 11 so that a laser beam may successively propagate from module 80 to module 80 by undergoing successive amplification and reflection therein. For example, a laser beam 24 received from end mirror 32 by AMA module 80a is amplified and reflected onto AMA module 80b, where it is received, amplified, and reflected onto AMA module 80c, and so on, until the amplified laser beam 24 exits the laser gain assembly 11. Similarly, a feedback laser beam 22 (originating from the outcoupling and feedback assembly 40) and propagating in an opposite direction to laser beam 24, is amplified and reflected by AMA modules 80 until it reaches the end mirror 32. At the end mirror 32 it is reflected, thus forming a laser beam 24.

Figure 7 shows a similar arrangement except that a ring resonator rather than a linear resonator is employed.

Contrary to the assertion in the Office Action, Vetrovec does not show two electromagnetic fields created by separate gain media. It will be appreciated that if any one of the modules 80 of Vetrovec were to be removed, all oscillation would stop. There is only one electromagnetic field propagating in Vetrovec,

which merely receives distributed amplification along its length from multiple serially arranged reflective gain media. There is no point at which separate electromagnetic fields are being coherently combined, because there is only one field. Even if it is true that there is equal optical delay within each gain region of Vetrovec's gain assembly 11, as stated in the Office action, such equal delays do not themselves establish multiple electromagnetic fields, but only equally-spaced points along one electromagnetic field. The gain modules 80 of Vetrovec are completely interdependent on each other to generate a single electromagnetic field within the resonator.

Based on the above, it is respectfully submitted that Vetrovec does not teach all the elements of claim 1. Specifically, Vetrovec does not show an unstable resonator and at least two gain media within the unstable resonator wherein a first electromagnetic field produced by a first gain medium of the at least two gain media propagates through a portion of a second gain medium of the at least two gain media after one or more roundtrips within the unstable resonator, and wherein the first electromagnetic field is in-phase with a second electromagnetic field produced by the second gain medium. Vetrovec's resonators employ gain media that all cooperate to create but a single electromagnetic field. There is no second electromagnetic produced by a second gain medium that propagates through a first gain medium and is in phase with a first electromagnetic field produced thereby.

Because Vetrovec does not teach all the elements of claim 1 as discussed above, Vetrovec cannot anticipate claim 1 under 35 U.S.C. § 102. Therefore claim 1 is seen to be allowable in view of Vetrovec.

Claims 2-4, 8-10, 13, 18-25, and 27-29 all incorporate, either directly or indirectly, features like those discussed above with respect to claim 1, and therefore these claims are also not anticipated under 35 U.S.C. § 102 by Vetrovec for at least the same reasons. Thus these claims are seen to be allowable in view of Vetrovec as well.

With respect to the rejection of the remaining claims under 35 U.S.C. § 103 based on a combination of Vetrovec with other references as noted above, all of these rejections rely on the incorrect assertion that Vetrovec teaches all the elements of independent claims 1 and 24. This assertion is refuted above. Therefore, the above combinations of references cannot render any of the remaining claims obvious under 35 U.S.C. § 103, and thus the remaining claims are seen to be allowable.

## Newly Added Claims

Claims 30-35 have been added and are believed to be in allowable condition. Claims 30-32 depend from claim 1, and claims 33-35 depend from claim 24. These claims specify that the first and second gain media are placed in a plane transverse to the longitudinal axis of the resonator, and are equally spaced from the longitudinal axis on different sides. These claims are even more clearly distinguished from Vetrovec and the other art of record, none of which teaches or suggests such a feature. Support for these claims can be found in Figure 1 and paragraphs 26 and 27, for example. No new matter has been added.

## Conclusion

In view of the amendments and remarks herein, this Application should be in condition for allowance. A Notice to this affect is respectfully requested. If the Examiner believes, after this Response, that the Application is not in condition for allowance, the Examiner is respectfully requested to call the Applicant's Representative at the number below.

Applicant hereby petitions for any extension of time which is required to maintain the pendency of this case. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50-0901.

If the enclosed papers or fees are considered incomplete, the Patent Office is respectfully requested to contact the undersigned collect at (508) 366-9600, in Westborough, Massachusetts.

Respectfully submitted,

James F. Thompson, Esq.
Attorney for Applicant(s)
Registration No.: 36,699
CHAPIN & HUANG, L.L.C.
Westborough Office Park
1700 West Park Drive
Westborough, Massachusetts 01581
Telephone: (508) 366-9600
Facsimile: (508) 616-9805

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